Downscaling of flooded fraction derived from low resolution multi-satellite measurements: SWOT preparation

Filipe Aires, Estellus, Paris France
Catherine Prigent, LERMA, CNRS, Observatoire de Paris, France
Fabrice Papa, LEGOS, IRD, Toulouse, France

SWOT, First Science Definition Team meeting, Pasadena, January 28-30, 2013

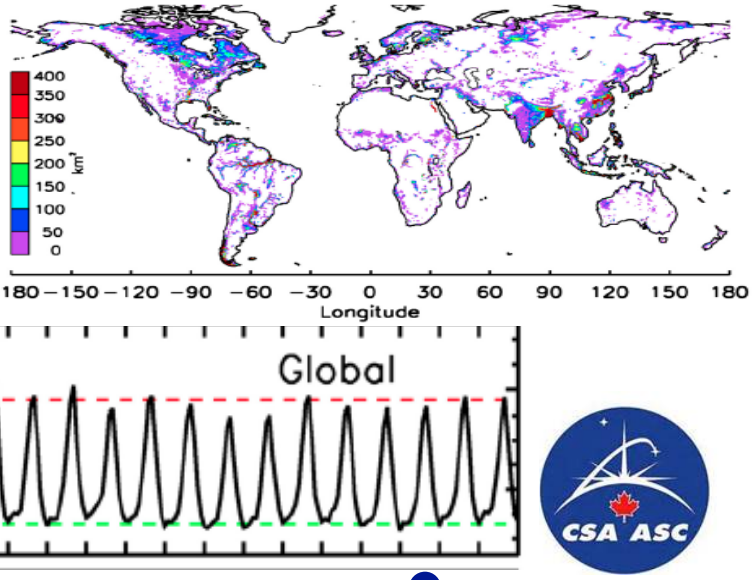
Existing high resolution surface water extent

- **Global but static**
  - From the collection of inventories (e.g. GLWD, from Lehner and Doll, 2004).
- **Over limited regions and limited time period, from satellites**
  - From satellite observations in the visible/IR images, only under clear conditions
  - From SAR images, even under clouds and forests, but very limited time sampling

Existing low resolution surface water extent

- **Global but static**
  - From inventories (e.g., Matthews and Fung, 1987 at 1° resolution)
- **Global and dynamic**
  - From multiple satellite observations (GIEMS)

=> Downscaling of the GIEMS



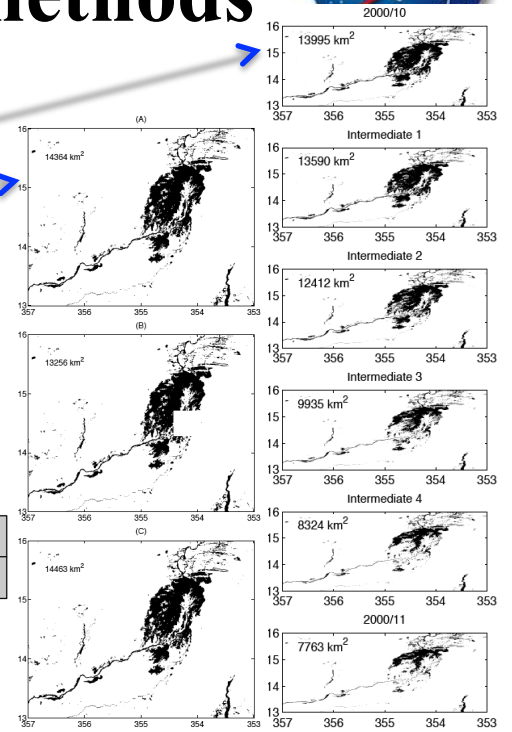
- A unique database of global surface water, at 0.25°×0.25°, monthly mean over 1993-2007 (Prigent et al., 2012)
- Derived from the combination of passive, active, visible, and infrared observations.
- Thoroughly evaluated (e.g., Papa et al., 2008, 2010)

Downscaling using an algebric methods

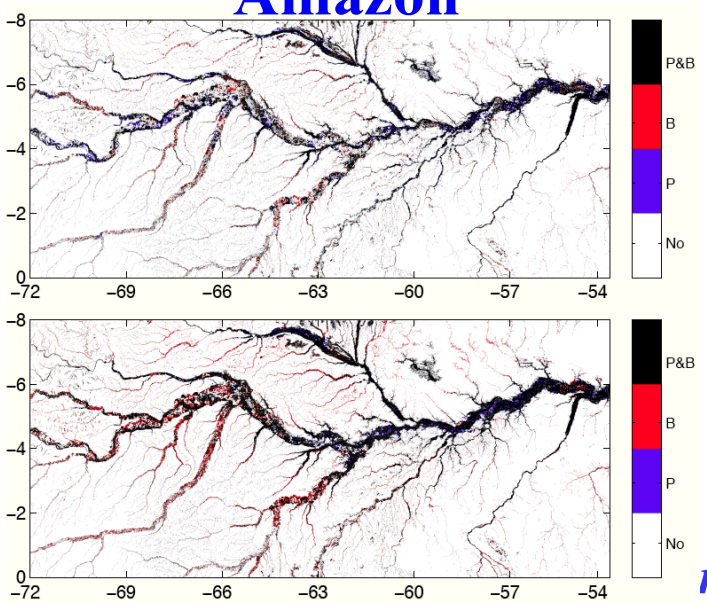
Two downscaling approaches

- Statistical: EOF representation plus algebraic optim 2013a), providing also interesting tools for:
  - Spatial (missing data) interpolation
  - Temporal interpolation
  - Inundation quality metrics
- Image processing (based on low- and high-inundat state and a neigborhood system) (Aires et al. 2013b).
- Over Amazon and Niger, at 500 m resolution, from 1993 to 2007

		Target: Positive	Target: Negative	
Retrieved	Positive	**True Positive** *(TP)*	**False Positive** *(FP)*	Positive predictive value *=TP/(TP+FP)*
	Negative	**False Negative** *(FN)*	**True Negative** *(TN)*	Negative predictive value *=TN/(FN+TN)*
		Sensitivity *=TP/(TP+FN)*	Specificity *=TN/(FP+TN)*	



Amazon

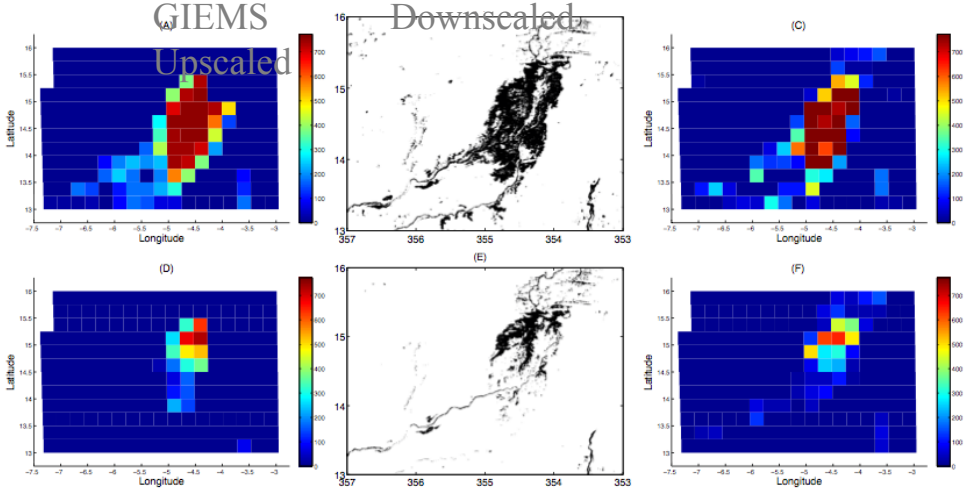


Niger

➔downscaling➔ ➔upscaling➔

GIEMS Upscaled

Downscaled



n Team

Perspectives and applications

- **New developments**
  - Use of basin topography as an additional information, or for application at global scale where no other information available?
  - Weekly interpolation of the datasets, at 100 m resol.
- **Before launch:**
  - Development of the SWOT retrieval algorithms (realistic simulator, learning dataset)
  - Selection of the calibration / validation sites
  - Water mask climatology for LR/HR switch
- **After launch:**
  - Evaluation of the SWOT results
  - Extension of the SWOT record in the past (1993-20
  - What is the impact of spatial resolution for

    for estimation of water volume change: